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APPLICATION

FOR

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ENTITLED

METHODS AND SYSTEMS FOR NETWORKED CAMERA CONTROL

TO WHOM IT MAY CONCERN:

BE IT KNOWN THAT (1) Peter A. Mottur and (2) Ethan Z. Zimmer of (1) 430 Black Point Lane, Portsmouth, RI 02871 and (2) 89 Overhill Road, East Greenwich, Rhode Island, 02818, invented certain new and useful improvements entitled as set forth above of which the following is a specification:

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# METHODS AND SYSTEMS FOR NETWORKED CAMERA CONTROL

## CLAIM OF PRIORITY

This application claims priority to U.S.S.N. 60/221,674, entitled "Systems And Methods For Delivering Live Action Feeds Over A Computer Network", filed on July 26, 2000, naming Peter Mottur and Ethan Z. Zimmer as inventors, the contents of which are herein incorporated by reference in their entirety.

## BACKGROUND

(1) Field

The disclosed methods and systems relate generally to delivering content over a computer network, and more particularly to providing content related to live action feeds controlled over the network by network users.

(2) Description of Relevant Art

The internet provides a platform for allowing the distribution of information and data such as multimedia data. Accordingly, one internet application includes broadcasting multimedia entertainment and other live action programming. Several internet websites exist that allow users to obtain live action programming that can be streamed throughout the internet to internet users. These websites can be integrated with one or more cameras, otherwise known as "webcams," that can be located

at locations to capture a particular field of view. Internet users having an internet browser with the necessary plug-ins or software applications, can receive the broadcast image data from the fixed camera locations. For example, websites can include points of views for major landmarks or other central locations in various cities to allow internet users to view the weather or scenery in the camera field of view. Other websites can utilize the fixed field of view to capture, for example, commonly congested traffic areas. Unfortunately, in the latter example, there could be a traffic problem at another area on a given day, that is not within the field of view. The information or data provided from the fixed field of view therefore may not provide sufficient information to a user on a given day. In other applications, a camera can be used to view or monitor a moving subject. If the subject moves outside the camera field of view, the monitoring user may not be able to perform the monitoring function. Some systems provide limited control of camera motion, but such control can be particular to a specific individual, user, and/or network location or device, and such control can also be extremely limited to discrete camera movements. Furthermore, many multimedia broadcasts include significant delays between image updates, resulting in choppy broadcasts that can appear to be, or may be, a string of static images that are presented with a discernible delay between successive images.

## SUMMARY

The disclosed methods and systems provide control of at least one camera to at least one network user. The camera(s) and network users can be in communication with each other through a network including the internet or a public or private network. The network users can utilize a microprocessor-controlled device that includes or displays an interface, including a graphical user interface (GUI), database or scripting interface, menu driven interface, etc., that can be collectively referred to herein as an interface. The interface can provide data from which camera control commands can be generated and transferred to the camera. Additionally, the camera can provide video (and audio) data for display or presentation to the network user. The audio/video data can be provided in real-time using uncompressed analog or digital streaming modes/formats to provide continuous feedback to the network user.

The connection between the network user and the camera(s) can facilitate communications via fiber optic, infrared, satellite, Radio Frequency (RF), microwave, cable, or Internet Protocol (IP), or other communications modes and/or protocols.

The interface can be provided by an applet or an application. In one embodiment, the interface can have a control area that can have a cursor within the control area. Movement of the cursor within the control area can be translated to camera controls. For one embodiment, the control area can be calibrated such that continuous commands can be provided to the camera based on the cursor position while the cursor is active. In one

embodiment, while the cursor is active, pan and tilt commands can be provided to the robotic pan/tilt head to which the camera is mounted, connected, or otherwise in communications. When the cursor is inactive, camera commands may not be provided to the camera. The interface can also have options for adjusting focus and zoom.

In some embodiments, control commands can be mapped or otherwise associated with keyboard features including keys, and/or other peripheral devices including joysticks, control panels, and touchscreens, using, for example serial cables (RS-232, 422, 485), Universal Serial Bus (USB), FireWire, other communications protocols and/or devices.

The disclosed methods and systems also include at least one queue for administering control between the network users and the cameras. Network users can request control of a camera, and depending upon whether the network user is a subscriber or non-subscriber, the network user can be provided or otherwise associated with a camera control time interval, and placed in the queue. Camera control can be determined from the queue position, with a single user having control of a camera at a given time, and for a given time interval that can be equal to the camera control time interval associated with the user.

In some embodiments, a system administrator can establish the control intervals for subscribers and non-subscribers. A system administrator can also provide conditions or rules by which queue position can be determined. Furthermore, a system

administrator can usurp control of the camera, remove a user from the queue, and deny a request from a user by preventing a user from obtaining position in a queue.

Other objects and advantages will become apparent hereinafter in view of the specification and drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram presenting features of the methods and systems disclosed herein;

FIG. 2 is a diagram of one embodiment for television broadcasting;

FIG. 3 displays an alternate embodiment for the methods and systems;

FIG. 4 presents one user interface for control of a camera(s); and,

FIGs. 5A and FIG. 5B present illustrative interfaces for providing queue status and control.

## DESCRIPTION

To provide an overall understanding, certain illustrative embodiments will now be described; however, it will be understood by one of ordinary skill in the art that the systems and methods described herein can be adapted and modified to provide systems and methods for other suitable applications and that other additions and modifications can be made without departing from the scope of the systems and methods described herein.

For the purposes of the disclosed methods and systems, references to a camera can include references to a camera system that can include a robotically controlled camera and a robotic pan/tilt head to which the camera can be connected, and a processor that can control camera features including white/black balance, iris, gain, RGB, phase, timing, SC, and other like features that can be collectively referred to herein as camera presets. In some embodiments, the camera includes a pan/tilt head, while in other embodiments, the pan/tilt head can be separate from the camera. Accordingly, in some embodiments, references to camera as provided herein, can include references to one or more processors (e.g., processor associated with the camera and a processor associated with pan/tilt head; one processor for the camera and the pan/tilt head, etc.).

The disclosed methods and systems include methods and systems for providing real-time continuous streaming video and audio data from at least one remote camera system and/or location, to network users on a network such as the internet an another public or private network. Furthermore, the methods and systems allow the network users to interactively control the cameras using continuous control methods and systems, wherein continuous camera control can be understood herein to include control commands provided at fixed intervals. The network users can control camera pan, tilt, zoom, focus, and camera presets using, in one embodiment, a user interface in the form of a control or touch pad. In some embodiments, focus and zoom

controls can be provided using "rocker" type buttons on the user interface that have up/down or +/- controls. In another embodiment, for example, slider controls can be used for variable speed control, and such examples are provided for illustration and not limitation. The pan, zoom, focus, and tilt controls can be fluid controls to allow control commands to be provided to the camera(s) in a continuous manner as provided herein, for fluid camera movement. The methods and systems can be employed in television or network broadcast, cable, satellite, wireless, and/or broadband applications, thereby enabling user interactivity over network/internet connections, digital or analog set-top boxes, and/or handheld wireless remote control devices. In some embodiments, the methods and systems also provide user queuing techniques to allow shared and ordered control of the cameras by the network users. Administrative usurping of camera control from network users can be allowed.

The methods and systems herein are not limited to the communication channel by which the camera control and/or video/audio streaming data can be communicated. Although examples of communications channels can include fiber optic, infrared, satellite, Radio Frequency (RF), microwave, cable, Internet Protocol (IP), etc., such examples are provided for illustration and not limitation.

Referring now to FIG. 1, there is an architectural block diagram **10** providing features for the methods and systems disclosed herein. Those with ordinary skill in the art will

recognize that FIG. 1, and other figures provided herein, can be provided for discussion purposes to illustrate features of the disclosed methods and systems. Accordingly, it can be understood that such features or parts thereof, unless otherwise noted, can be combined, further expanded upon with additional detail, and/or otherwise eliminated, without departing from the scope of the methods and systems.

FIG. 1 presents a system that includes a regional distribution center **12** that can otherwise be understood as a Network Operating Center (NOC). The center **12** can include one or more encoders **14a, 14b**, that can accept uncompressed audio-video input from one or more cameras **16a-16f**. The encoder outputs can be input to an Internet Video Streaming (IVS) web server **18** and a Direct Television (SDI/DTV) or MPEG (MPG) video server **20**. The servers **18, 20** can communicate with a point-of-presence (POP) server **22** to distribute audio-visual data from the cameras **16a-16f** using IVS **24**, MPEG (MPG) **26**, or MPG/DTV **28** audio-video formats. The audio-video formats can additionally be compatible with Real Networks, Windows Media Player, Quicktime, MPEG-2, etc., where such examples are provided for illustration and not limitation. The audio-visual data from the cameras **16a-16f** can additionally and optionally be presented to a video switcher **30** and thereafter to a telephone communications provider or television company **32** that can distribute compressed or uncompressed audio-video data for broadcast in a format that can

include analog or digital television (SDI/DTV), including high-definition digital television (HDTV) **34**.

The FIG. 1 cameras **16a-16f** can include, for example, robotically controlled cameras that can be commercially available from manufacturers including Panasonic, Sony, Canon, Pelco, Hitachi, Fujinon, Phillips, JVC, and Sensormatic, with such examples provided merely for illustration and not limitation. As indicated previously, the cameras **16a-16f** can communicate uncompressed audio and video data to the center **12** using fiber optic cable, for example. The encoders **14a, 14b** can encode the uncompressed video data for presentation to the servers **18, 20** that can thereafter distribute the data over a network or other communications link. Although the illustrated encoders **14a, 14b** receive inputs from multiple cameras **16a-16f**, other embodiments can include a one-to-one relationship between encoders **14a, 14b** and cameras **16a-16f**.

The illustrated web server **18** can be equipped with software, hardware, or a combination thereof, that can convert the data for compatibility with MPEG 1/2/4, JPEG, M-JPEG, RTP, RTSP, or Java Media Framework (JMF), or other formats that can be compatible with, for example, a Quick Time server, a Real Player server, a Windows Media server, or another server that can deliver audio-video data over a network.

The illustrated video server **20** can also compress the uncompressed audio-video data from the encoders **14a, 14b**, to allow a format suitable for delivery over a network. As FIG. 1

illustrates, the POP server **22** can receive data from either the web server **18**, the video server **20**, or both.

The illustrated servers **18, 20, 22** can be one or more microprocessor-based systems including a computer workstation, such as a PC workstation or a SUN workstation, handheld, palmtop, laptop, personal digital assistant (PDA), cellular phone, etc., that includes a program for organizing and controlling the server **18, 20, 22** to operate as described herein. Additionally and optionally, the server **18, 20, 22** can be equipped with a sound and video card or device for processing multimedia data. The server **18, 20, 22** can operate as a stand-alone system or as part of a networked computer system. Alternatively, the server **18, 20, 22** can be a dedicated device, such as an embedded system, that can be incorporated into existing hardware devices, such as telephone systems, PBX systems, sound cards, etc. In some embodiments, servers **18, 20, 22** can be clustered together to handle more traffic, and can include separate servers for different purposes such as a database server, an application server, and a Web presentation server. The server **18, 20, 22** can also include one or more mass storage devices such as a disk farm or a redundant array of independent disks ("RAID") system for additional storage and data integrity. Read-only devices, such as compact disk drives and digital versatile disk drives, can also be connected to the server **18, 20, 22**. Additionally and optionally, the client-server model is well known as a relationship between a requester program, otherwise known as the

client, and the program that services the request, otherwise known as a server **18, 20, 22**. It is also well-known that the client and server **18, 20, 22** can reside on the same device, and such understanding can be applied to the disclosed methods and systems and to FIG. 1, where the servers **18, 20, 22** can also be viewed as clients in the client-server model. As used herein, the term "server" is intended to refer to any of the above-described servers.

For a system according to FIG. 1, data from the cameras **16a-16f** can be multiplexed and provide for lower bandwidth video that can be viewed on conventional internet devices that can utilize web browsers and/or at least one software application. The multiplexed video data can be provided on-demand from the video server **20** to data network users that, in one embodiment, utilize Internet Protocol (IP). As indicated herein, the video data can be distributed over private networks or public networks such as the internet.

In some embodiments, the audio-video data from the cameras **16a-16f** can be communicated using an intra-lata (local access transport area) service that can otherwise be known as local toll, regional, or zone service. The intra-lata service can also be used for distributing the audio-video data from the center **12** to the network.

Referring now to FIG. 2, there is a system **40** for coupling or integrating a kiosk **42** to the center or NOC **12** and thereafter to a broadcaster **44** to exchange data between the kiosk and the

broadcaster **44**. In the FIG. 2 system, an IP device **46** can couple at least one internet user **48** to the broadcaster **44** to receive audio-video data from the kiosk **42**. The broadcaster **44** can optionally and additionally transfer the data through a television broadcast.

The FIG. 2 kiosk **42** can include a robotic camera as described previously herein. Furthermore, the kiosk **42** can be equipped with a video prompter, audio devices (microphones, mixers, compressors, speakers, etc.), and a microprocessor-controlled device that allows remote control of the camera, lighting, LCD ticker, microphones, and other systems integrated with the kiosk. Accordingly, the internet users **48** can interact (i.e., via IP control) with the broadcast from the kiosk **42** by controlling the camera via a control server **50**. The control server **50** can allow control by providing a graphical user interface, for example, to the users **48** to allow the users **48** to control the kiosk camera(s) and hence interact with the television broadcast. The graphical user interface can be provided, for example, using a Java applet or an application.

Referring now to FIG. 3, there is a block diagram **60** for representing systems and methods that can be integrated with the systems and methods of FIGs. 1 and 2. Those with ordinary skill in the art will recognize that FIGs. 1, 2, and 3, and other Figures provided herein, can provide similar features of varying detail. Accordingly, as illustrated in FIGs. 2 and 3, the user **48** can be understood to include an initiating device **62** that can

include a digital computer system that can utilize a wired or wireless communications link to connect to a communication network such as the internet. The user(s) **48** of the initiating device **62** can utilize different peripheral devices that can be integrated with or otherwise configured for compatible use with the initiating device **62**. For example, the initiating device **62** can include a keyboard, keypad, stylus, joystick, digital camera, microphone, etc., that can communicate data to the initiating device using wired or wireless communications systems and/or protocols, etc. The initiating device **62** can be a microprocessor-based system including a computer workstation, such as a PC workstation or a SUN workstation, handheld, palmtop, laptop, personal digital assistant (PDA), cellular phone, etc., that includes a program for organizing and controlling the initiating device **62** to operate as described herein. Additionally and optionally, the initiating device **62** can be equipped with a sound and video card for processing multimedia data. The initiating device **62** can operate as a stand-alone system or as part of a networked computer system. Alternatively, the initiating device **62** can be a dedicated device, such as an embedded system, that can be incorporated into existing hardware devices, such as telephone systems, PBX systems, sound cards, etc. Accordingly, it will be understood by one of ordinary skill in the art that the initiating device **62** described herein has wide applicability and can be incorporated in many systems, and realized in many forms.

For a system according to FIG. 3, the initiating device **62** can be connected to a network such as the internet and can be equipped with what is well-known as an internet "browser" such as the commercially available Netscape Navigator, Internet Explorer, etc., browsers, and those with ordinary skill in the art will recognize that, depending upon the initiating device **62** and its configuration, the browser can differ, and hence references herein to a browser can include references to a user interface to the internet or other network, wherein the methods and systems herein are not limited to the browser or other network interface. Furthermore, the initiating device **62** can access the internet using wired or wireless communications links and/or protocols.

Referring again to FIG. 3, the user **48**, via the initiating device **62**, can request information via a network from one or more web servers **64**, for example. The illustrated web server **64** can include features that have previously been described in relation to the NOC **12** and the control server **50**. Additionally and optionally, the web server **64** can include one or more applets and/or applet tags **66** that can cause an applet on the web server **64** or another server (or web server) to be communicated or otherwise available to the initiating device **62**. For the methods and systems disclosed herein, an applet or applet tag **66** can provide at least one interface that, in the illustrated embodiments is a graphical user interface (GUI), for display on the initiating device **62**. Those with ordinary skill in the art will recognize that the interface is not limited to an interface,

and can include, for example, database or scripting interface, menu driven interface, etc., and accordingly references herein to a or the interface can be understood to be references to an interface that can operate according to the methods and systems disclosed herein. For example, in a database interface, a camera **16** can be positioned at predetermined locations at corresponding times.

In one embodiment of the FIG. 3 systems and methods, an interface can be manipulated or otherwise controlled by the user, and the control can be communicated to the camera(s) **16**. Furthermore, another applet **66**, or additionally and optionally, an application residing on the initiating device **62**, can cause the initiating device **62** to display or otherwise present audio/visual data to the user **48** in a real-time continuous streaming mode. The user **48** can, through the interface, control the camera **16** with real-time continuous audio/visual feedback.

As indicated previously herein, in some embodiments, the web server **64** can be a separate device or program from the control server **50**, the NOC **12**, and other features of the web server **64**. For example, in an embodiment, the control server **50** and NOC **12** can be separate servers and can have separate processors that can be in communication with the web server **64**. Additionally and optionally, the NOC features **12** and the control server **50** can be integrated with the initiating device **62** or one or more processors related to or otherwise associated with the camera **16**. Those with ordinary skill in the art will thus recognize that

there are various configurations of the FIG. 3 system that can be employed without departing from the methods and systems provided herein.

Referring now to FIG. 4, there is an illustration of one interface that is a graphical user interface (GUI) **70** that can be provided to the initiating device/user **62, 48** for controlling the camera **16** according to a system of FIG. 3. The FIG. 4 interface **70** can be presented with a window or other presentation of audio/visual data such that the user **48** can view audio/video data based on the camera **16** positioning, as the user **48** controls the camera **16**.

The illustrated interface **70** includes a control pad or area **72** that includes an origin designation **74** that, in the illustrated embodiment, is a "+", although other origin designations can be used. The control pad also includes a cursor **76** that can be controlled by the user **48**. For example, in one embodiment, the user **48** can control the cursor **76** by dragging the cursor with a mouse, stylus, joystick, or other peripheral device that can be integrated according to the methods and systems to control the cursor **76**. In other embodiments, the cursor **76** can be directed using voice commands or by utilizing an interface that otherwise allows the cursor **76** to be positionally directed within the control area **72**. In the illustrated embodiment, the illustrated cursor **76** cannot leave the control area **72**.

The illustrated interface **70** can be calibrated or otherwise configured such that when the cursor **76** is placed at the origin

74, the camera position remains fixed. Accordingly, for the illustrated interface 70, the control area 72 can be understood to be continually relative to the current camera position. Consequently, as the cursor moves from the origin 74, corresponding control commands can be generated and provided to the camera 16 to allow continuous camera control and fluid camera positional movement in the pan and tilt directions. These directions can also be referred to as range and azimuth, or x and y, and the disclosed methods and systems are not limited to a choice of coordinate system or axes representation or labeling.

For purposes of discussion herein, camera 16 control can be referred to as pan and tilt, where pan can be understood to be left-right camera motion, while tilt can be understood to be camera up-down motion. With regard to the illustrated control area 72, the control area 72 can be described with reference to the cartesian coordinate system, such that left-right cursor 76 motion can be referred to herein as motion in the "x" direction, while up-down (tilt) movement can be referred to herein as cursor motion in the "y" direction. Accordingly, for the illustrated control area 72, cursor 76 movement solely in the x direction, along the x-axis origin 74, translates to panning the camera 16 with increased magnitude (speed) as the distance from the origin increases. Similarly, for the illustrated control area 72, cursor 76 movement solely in the y direction, along the y-axis origin 74, translates to tilting the camera 16, with increased magnitude (speed) as the distance from the origin increases.

Furthermore, moving the cursor **76** in both the x and y directions translates to camera **16** control in both the pan and tilt directions.

The illustrated control area **72** can be calibrated such that distance from the origin **74** in the x and y directions can be translated into corresponding pan and tilt camera control commands. The calibration and camera control commands can be based on the camera **16**, camera **16** type, camera interface, etc. For example, in some embodiments, the control area **72** can be understood to include a grid where the cursor **76** movement can be measured based on the grid position. The grid may or may not be visible to the user **48** via the interface **70**.

For the illustrated systems and methods, camera control is only provided when the cursor **76** is activated. As an example, consider that a user "activates" the cursor **76** in the control pad area **72** by selecting the cursor **76** with a computer mouse, and subsequently drags the cursor **76** to a position that can be viewed as one unit in the x-direction, and two units in the y-direction. Based on the cursor **76** position, pan and tilt commands, or the equivalent thereof, can be provided to the camera **16** (camera driver(s)) based on the x and y cursor positioning. In some embodiments that can be dependent upon the camera **16**, camera commands can be provided for diagonal movement of the camera **16**, or incremental pan and tilt movements can be provided to the camera **16** to achieve the desired positioning. For the illustrated systems and methods, should the user **48** maintain an

active cursor **76** at a fixed, non-origin position, camera commands of the same magnitude and in a continuing process can be transmitted to the camera **16**. Alternately, in the illustrated embodiments, when the user **48** "deactivates" or inactivates the cursor **76** in the control pad area **72**, including releasing a computer mouse button, the illustrated cursor **76** can return to the origin **74**, thereby ceasing the transmission of control commands to the camera **16**. In an embodiment, deactivation of the cursor **76** can cause the transmission of a "stop" command to the camera **16**. In some embodiments, deactivating the cursor **76** can cause the camera **16** to receive pan and tilt commands that do not provide any camera **16** movement. Accordingly, one of ordinary skill in the art will recognize that cursor positioning at the origin **74** can provide an option to cease camera control command transmission, or can equivalently cause camera control commands to be transmitted that cause no camera **16** movement. Different camera control commands can be generated from the illustrated interface **70**, and in particular, the cursor **76** position, depending upon camera **16** and other system requirements.

Accordingly, for the illustrated interface **70**, the further the distance of the cursor **76** from the origin **74**, the greater the magnitude of the camera control commands. In one embodiment, if camera control commands are provided in a continuous manner, at fixed intervals such as once every millisecond, based on the cursor **76** position, greater magnitude commands can translate into more rapid camera movement as the camera **16** can attempt to move a

greater distance in the same one millisecond command interval. As indicated herein, the maximum camera control commands for one camera **16** can be different from the maximum camera control commands for another camera **16**, and hence the interface **70** can be calibrated accordingly. In some embodiments, the same interface calibration can be used for multiple cameras, with the calibrations performed as the cursor position is translated to camera commands.

As FIG. 4 also indicates, the interface **70** can include options for focusing **78** and zooming **80** the camera **16**. Because the illustrated focus **78** and zoom **80** features are not included in the illustrated control area **72**, utilization of such features implies that the control pad cursor **76** is deactivated or inactivated and hence positioned at the origin **74**, thereby indicating a non-mobile camera **16**. Although the illustrated interface **70** does not include a visible cursor for the focus **78** and zoom **80** areas, it can be understood that a cursor can be activated for those areas **78, 80** when the user **48** depresses a button in the illustrated regions **78, 80** or otherwise causes the focus **78** and/or zoom **80** features to be enabled. For one embodiment using the illustrated interface **70**, depressing a computer mouse button in the focus or zoom areas **78, 80** can be understood to be cursor activation, while releasing the computer mouse button can be understood to be cursor inactivation. In some embodiments, dual control of the cursor **76** and focus **78** and/or zoom **80** features can be available, and in some

embodiments, the focus **78** and/or zoom **80** features can be combined with the features of the control pad **72**.

Although not illustrated in FIG. 4, an interface or GUI for the disclosed methods and systems can include controls for camera presets, previously defined herein as camera settings or features that can include white/black balance, iris, gain, RGB, phase, timing, SC, and other like features.

As indicated previously, continuous camera control can be understood herein to include control commands that can be transmitted to the camera at fixed intervals for a given time period. For example, as previously provided, camera commands can be transmitted to the camera **16** while the cursor **76** is active, and such commands can be sampled and/or transmitted at a rate of once per millisecond. As also indicated herein, control commands can vary, and can include, for example, pan, tilt, focus, zoom, camera presets, or combinations thereof. Accordingly, in one embodiment of the methods and systems herein, the given time interval during which control commands can be generated can be, for example, the time period during which the cursor **76** is active. As indicated herein, for the illustrated interface **70**, the cursor can be active in the control pad area **72**, or while operating the focus **78** and/or zoom **80** features.

The illustrated interface **70** also includes a location preset camera positioning option **82** such that a user can designate a fixed camera position for future retrieval. The illustrated interface **70** thus provides a drop-down box **82** that can retrieve

previously defined or stored camera positions. Selections of the predefined positions can cause appropriate camera commands to be transmitted to the camera **16**, to cause the camera **16** to be positioned at the desired, specified, and predefined position or location.

The FIG. 4 interface **70** also provides an option to exit **84**. When a user **48** selects the illustrated exit option **84**, the user **48** relinquishes control of the camera **16**. In some embodiments, exit **84** selection can cause the interface **70** to be eliminated from the user's display, while in other embodiments, exit **84** selection merely causes the user to relinquish camera control.

As indicated previously herein, the methods and systems include features for allowing more than one user **48** to control a camera **16** over a network interface. The illustrated methods and systems can implement a dynamic queuing feature that can facilitate the shared control. In the illustrated systems as provided in FIGs. 3 and 4, users **48** can subscribe to or otherwise register with the web server **64** or control server **50**. Such users **48** can, for example, be provided user names, accounts, passwords, and login information such that when the registered users **48** access the web server **64**, the users can be recognized as a subscriber or registrant. The methods and systems disclosed herein can also make features available to a system administrator of the web server **64** or the control server **50** that can allow the server(s) **64, 50** to provide designated features, capabilities, or privileges to subscriber users **48**. Alternately, a system

administrator can configure the methods and systems such that non-subscriber users **48** may not be afforded or provided such privileges. Accordingly, the methods and systems can allow camera control options for subscriber users (e.g., pay-per-view access), non-subscriber users, and system administrators.

In one embodiment of the illustrated systems and methods, subscriber users can be provided priority regarding camera control. Accordingly, for the illustrated embodiments, a camera **16** can be controlled by only one user **48** at a single time. Requests for camera control can hence be initiated by a user **48** and received by the web server **64**, for example. Based on the user's status as a subscriber or non-subscriber, the web server **64** can generate a camera control queue that provides priority to subscriber users **48**. Camera control can be for a specified time interval, and camera control intervals for subscribers can be different than camera control intervals for non-subscribers. In some embodiments, camera control intervals can be based on the number of requests. In an embodiment, camera control intervals can be based on subscriber fees. Camera control interval features can be configured by a system administrator.

Those with ordinary skill in the art will recognize that there are various systems and methods for managing queues, and such methods and systems can be designated by a system administrator based on system requirements. In one embodiment, non-subscriber requests may only be processed after subscriber requests are fulfilled. Additionally and optionally, subscriber

camera control time intervals can be longer than non-subscriber intervals. Once a camera control time interval expires, the user **48** can be automatically re-entered into the camera control queue. Alternately, a user **48** who terminates (e.g., "exit" **84**) the camera control interval before expiration may not be re-entered into the queue.

In some embodiments, subscriber requests may only take precedence over non-subscriber requests at predefined times. In an embodiment, the system administrator can usurp control of the camera **16** from a user **48**. Once the system administrator relinquishes camera control, the requests for queuing can be processed based on the queue status before the system administration usurpation. A camera control interval associated with the user **48** from which control was usurped by the system administrator, can be suspended such that when the system administrator relinquishes control, the user **48** from which camera control was usurped can be credited with control and the remaining camera control interval before the usurping.

In some embodiments, system administrators can remove a user from the queue, and/or permanently deny a user of privileges. Furthermore, a system administrator can usurp control from a user, and thereafter prevent the camera control from returning to that user. In an embodiment, system administrators do not have time limits on camera control.

In some embodiments, users **48** can be provided with a display of the current camera control user's remaining camera control

time interval. Such display can be represented as a reverse stop-watch display. Users **48** can also be presented with a display of the camera control queue order, where users can be identified by login name or other specified identity data. Such data can influence a user **48** to request control of one camera **16** in contrast to requesting control of another camera **16** that may have more requests.

An illustration of one display method or interface for the methods and systems herein can be seen in FIGs. 5A and 5B. FIG. 5A displays an interface **90** wherein the user in control of the camera **16** is called the "driver", and is identified as Guest_52. The user being shown the display is known as Guest_58, and a queue status display **92** can indicate the current driver and the queue status that includes three parties, the associated queue order for camera control for the three parties, and the time allotted for the three parties. The display **90** also includes the status of the current driver's time interval, and an option **94** to allow the present user (i.e., Guest_58) to enter the queue.

FIG. 5B presents an interface **96** that allows a user to exit the queue. The FIG. 5B an interface **96** is similar to the FIG. 5A interface **90** and provides a queue status area **98** and a user-selectable option to exit from the queue **100**.

When a user in the queue becomes the driver and is provided camera control, the driver can be provided with both visual and audio indications of such status. For example, in one embodiment, the new driver can be provided an audio signal such

as a beep. Additionally and optionally, the driver's interface and/or display can be altered to indicate control mode versus queue mode.

For the illustrated systems and methods, a chat feature can be simultaneously provided on the display that includes the audio-visual data from the camera **16**. Users can accordingly share comments and other data via the chat feature. The chat feature(s) can allow real-time chat and can be implemented using an applet or applet tag **66** that can be located on the web server **64**. Based on the disclosed methods and systems, chat features can be provided to internet users, television users, and other system users.

The disclosed methods and systems can also be utilized to allow the transmission, broadcast, and/or webcast of live performances, or commercials, that can be understood herein as LiveMercials. In one embodiment of LiveMercials, an advertiser or sponsor can purchase or otherwise negotiate media space and/or time on a network that utilizes the disclosed methods and systems. The advertiser can determine the location and/or camera from which to collect the audio/visual data, the target audience to receive the collected data, the time to collect and/or broadcast or distribute the data, and the format for the audio/video data distribution. In some embodiments, audience members can participate on-site and/or on-line using a real-time ratings system that can provide real-time feedback from the

audience to the advertiser. As disclosed herein, a LiveMercial can include audio and visual data.

In one example of LiveMercials, live auctions can be performed by allowing products and/or services to be presented for bidding by real-time, on-site and/or on-line audience members.

Those with ordinary skill in the art will recognize that the methods and systems disclosed herein can be platform independent and can operate using a variety of operating systems. As indicated previously, the methods and systems can also be independent of the camera. As indicated herein, in some embodiments, a user can be provided with a choice of cameras from which to select, wherein the several cameras can be positionally distinct.

What has thus been described are methods and systems for providing fluid real-time camera control of at least one camera to at least one network user via a network including the internet. A control pad or area can be provided to camera users via an application or applet that can be calibrated to provide fluid camera control. Compressed or uncompressed analog, digital, or streaming video and audio data can also be provided to the users to allow real-time low latency continuous audio/visual feedback. Multiple camera users can obtain control of a camera using a dynamic queuing technique that can allow single user camera control for certain time intervals. An administrator can establish user camera control parameters

including camera control intervals for subscriber users versus non-subscriber users, camera usurping by an administrator, elimination of camera control privileges for a user, and denial of camera control requests by a user.

The methods and systems described herein are not limited to a particular hardware or software configuration, and may find applicability in many computing or processing environments. The methods and systems can be implemented in hardware or software, or a combination of hardware and software. The methods and systems can be implemented in one or more computer programs executing on one or more programmable computers that include a processor, a storage medium readable by the processor (including volatile and non-volatile memory and/or storage elements), one or more input devices, and one or more output devices.

The computer program(s) is preferably implemented using one or more high level procedural or object-oriented programming languages to communicate with a computer system; however, the program(s) can be implemented in assembly or machine language, if desired. The language can be compiled or interpreted.

The computer program(s) can be preferably stored on a storage medium or device (e.g., CD-ROM, hard disk, or magnetic disk) readable by a general or special purpose programmable computer for configuring and operating the computer when the storage medium or device is read by the computer to perform the procedures described herein. The system can also be implemented as a computer-readable storage medium, configured with a computer

program, where the storage medium so configured causes a computer to operate in a specific and predefined manner.

Although the methods and systems have been described relative to a specific embodiment thereof, they are not so limited. Obviously many modifications and variations may become apparent in light of the above teachings. For example, as indicated previously herein, multiple cameras can be controlled by a single user, and the multiple cameras can be of different types with different connections (wired, wireless, satellite, infrared, laser, etc.) between the user and the camera or intermediate elements between the user and camera(s). Although the interface presented herein for camera control included a GUI with a cursor, other interfaces can be utilized that do not utilize a cursor for camera control, and can use other graphics or schemes to provide and/or demonstrate control features. Although the illustrated interface included an origin designation in the center of the interface, the origin can be at a different location in the interface. Furthermore, in some embodiments, an origin designation may not be included, and cursor activation can occur by, for example, clicking a computer mouse in the control area. Although the illustrated interface also included buttons for increasing and decreasing focus and zoom, other methods for generating focus and zoom commands can be provided. The user interface can be, for example, text-based or menu driven in some embodiments, rather than graphical.

Many additional changes in the details, materials, and arrangement of parts, herein described and illustrated, can be made by those skilled in the art. Accordingly, it will be understood that the following claims are not to be limited to the embodiments disclosed herein, can include practices otherwise than specifically described, and are to be interpreted as broadly as allowed under the law.